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ABSTRACT

This document reports the findings of a World Health Organization Study Group on training and education in occupational health. The report is organized in 11 sections that cover the following concerns: (1) occupational health care in developing countries; (2) the primary health care approach; (3) current occupational health problems; (4) existing resources; (5) education and training objectives; (6) continuing education; (7) the role of professional organizations; (8) manpower planning; (9) international cooperation in training activities; (10) some examples of training content; and (11) recommendations. (KC)

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Geneva, 24–28 November 1986

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TRAINING AND EDUCATION IN OCCUPATIONAL HEALTH

Report of a WHO Study Group

A WHO Study Group met in Geneva from 24 to 28 November 1986 to discuss training and education in occupational health. Dr Lu Rushan, Assistant Director-General, opened the meeting on behalf of the Director-General. He referred to the eighth report of the Joint ILO/WHO Committee on Occupational Health (*1*) and its extensive review of training and educational objectives in occupational health, safety, and ergonomics. Dr Lu noted, however, that the dynamic development of industrialization throughout the world, with changing patterns of hazards to workers' health, required that occupational health practice be adapted.

Dr Lu said that this Study Group was required to examine the needs for education and training in occupational health in both developing and industrialized countries in the light of technological developments. In industrialized countries the fundamental changes in many industrial processes called for corresponding changes of emphasis in the various fields of occupational health care. For example, the influence of automation in industry had been associated with the redistribution of industrial populations as well as with new types of occupational health hazard, including various multifactorial work-related diseases; there was also a need to evaluate psychosocial factors at work and the application of ergonomics. Because of these and other changes it was essential to adapt education and training to the present needs in occupational health care.

1. INTRODUCTION

In developing countries, occupational health personnel are in short supply in practically all fields and at all levels. Emphasis on primary health care for the underserved working populations will require the establishment of new types of personnel in occupational health,

including primary health care workers and district health officers who are capable of dealing with workers' health.

In 1981, the Joint ILO/WHO Committee on Occupational Health dealt with education and training in occupational health, safety, and ergonomics. The needs for education and training were examined in the light of the evidence of a general lack of trained personnel in many countries, a shortage of facilities for the provision of continuing training, and the limited coordination of international efforts and intercountry cooperation. That Committee discussed the objectives of education and training in occupational health and safety and examined the most appropriate techniques and methods (*1*).

Since 1981, there have been important changes in the field of occupational health in both developing and industrialized countries. These changes include: (*a*) new policies on primary health care strategies adopted by the WHO Member States; (*b*) new needs resulting from technological developments; and (*c*) new approaches to health promotion at work. This report reflects the dynamism in occupational health and safety and describe the changes required in training and education.

Because of this dynamism, the Study Group limited its consideration of education and training in occupational health to a few fundamental aspects that are of greater immediate interest, although there is likely to be a need for a further revision of the present report in a few years' time.

There has always been a moral obligation to provide education in occupational health and safety for the working population, since all workers have the right to be adequately informed about the occupational risks they face and to know what protective measures should be adopted. Nowadays, the increasing participation of workers and their representatives in occupational health activities and the great improvement in the general educational level of workers, require that all workers be educated in occupational health and safety, and that those who assume responsibilities in this area receive special training. Socioeconomic advances will mean that the occupational health service personnel will have to regard the worker not only as a patient (or more often as a potential patient) to be maintained in good health, but also as a social partner in the structural model of work. They will have to understand the role of the workers in society and be aware of their rights and aspirations.

Health education of workers is one of the major occupational health functions. It is an essential component of total health care because it aims to promote health and to postpone the appearance of chronic illness. This health education deals with life-style and living habits, such as smoking, drinking, eating, exercise, rest, and leisure. To be effective in inculcating good personal habits, health education requires knowledge, perseverance, persuasion, imaginative efforts, adequate use of audiovisual aids, and a good example from the educator. In order to achieve positive results, health personnel need to receive training in health education techniques. In a small community, such as a production unit, a few positive results may create general acceptance, but inappropriate and boring counselling may result in total failure. Use of the workplace for health education should be perceived by management as being of benefit to the enterprise because an improved attitude to work cannot be separated from an improved attitude to life.

The prevention of chronic illnesses, by positive health education, means offering the older worker the opportunity to continue regular work up to retirement age, and subsequently perhaps some part-time work or at least the opportunity to enjoy leisure activities to the full during retirement. Prevention of chronic illnesses is probably the only realistic means of reducing the expenditure on medical care, which has grown tremendously in recent years and become a national problem in several countries (*2*).

One of the recent changes in occupational health has been the increasing emphasis on work-related diseases. The area of occupational pathology has now expanded greatly and is approaching more and more that of internal and clinical medicine. Thus, not only are occupational risks more complex than in the past, because of the coexistence in the same country, in the same branch of industry, and even in the same enterprise, of old and new occupational hazards, but also the multiple etiology of work-related diseases implies a greater responsibility, and a greater difficulty, in identifying work-related causes. The occupational physician (and other health care personnel) must receive adequate training in recognizing the existence of work-related causes for ill-health.

The first requirement is obviously sound clinical judgement, but once a work-related cause is suspected, epidemiological methods are required to investigate it. The occupational physician may examine hundreds or thousands of workers each year, thus permitting the ac-

cumulation of a wealth of material suitable for epidemiological investigations aimed at identifying and studying work-related diseases. But to be of value, the data must be well collected; even then, they have no value to the general health of a work force without proper epidemiological study.

The need for a greater understanding by occupational health personnel of social problems originating outside the boundaries of the workplace is particularly obvious when immigrants form part of the work force. Such health personnel will need adequate training in tropical and communicable disease and must be aware of the possibility of increased sensitivity of some of these workers to occupational hazards. Immigrant workers should receive the same education in occupational health and safety as the native workers. Attention should be given to possible language difficulties.

Increased levels of female employment in both developed and developing countries require that training in problems relevant to women's work be given to all those responsible for occupational health, safety, and ergonomics. Unfortunately in this area, it has become clear in recent WHO meetings that there are many gaps in current scientific knowledge (*3*).[1] Occupational health personnel need to be taught how to face problems of women's fitness to work, taking into account domestic problems, special sensitivities to some occupational hazards, reproductive health, and family planning. It is essential that workers' education programmes consider women's problems and include the basic elements of maternity protection, family planning, and counselling. The workplace must now be considered as a part of the overall human society, reflecting the problems of both males and females.

Problems concerning older workers should also be part of the training of occupational health personnel. There will often be a need for some ergonomic adaptation of the workplace to compensate for physical, physiological, and psychosensorial limitations due to age. Medical surveillance of these workers should be focused particularly on cardiovascular, degenerative, and malignant diseases. It should also be appreciated that a number of work-related diseases are likely to appear among older workers as a result of adverse working conditions many

[1] Report of the WHO Expert Committee on Occupational Health for Working Women, Geneva, 26 March – 1 April 1985. Unpublished document WHO/OCH/86.1.

years previously. These workers are, of course, of special interest in epidemiological investigations.

2. THE PRIMARY HEALTH CARE APPROACH

The Study Group considered the primary health care approach to occupational health care. While there was general agreement that occupational health is the discipline that deals with the influence of work on health and of health on work, there were different interpretations of the concept of primary health care. The prevailing view was that primary health care is an approach that has the following basic features: (*a*) equity in population coverage; (*b*) workers' participation in their health care; (*c*) team work among staff of various disciplines; (*d*) a comprehensive approach to health; and (*e*) the best use of available resources (*4*).

The Study Group believed that it was essential for occupational health personnel to use the primary health care approach, in particular to provide services for the very many workers at present underserved, including large numbers of workers in agriculture, small industries, and the construction industry. Health care personnel in workplaces should keep abreast of changes in technical procedures and methods of work, which are often associated with changes in health hazards. It is also essential to secure the active involvement of workers in health and safety practices and to educate them in personal health care. Life-style has an important influence on the worker's health. Health education programmes to encourage workers to give up smoking, to eat a healthy diet, and to take physical exercise not only prevent diseases but also contribute to health promotion and better productivity.

The primary health care approach is also comprehensive. For many years, occupational health has concerned itself with the control of specific diseases resulting from exposure to chemical and physical hazards. This is a limited approach that does not much serve the health care needs of workers in either developing or industrialized countries. The health problems associated with parasitic infections and malnutrition should be treated among workers in developing countries. In industrialized countries the workers are in need of comprehensive health care that includes attention to problems related to psychosocial stress, hypertension, cardiovascular diseases, and alcoholism.

The team work called for by the primary health care approach is frequently seen in occupational health care where medical personnel cooperate with hygienists, safety supervisors, and nurses to prevent diseases and injuries through a team approach to environmental control of health, safety hazards, and preventive medical interventions, e.g., placement examinations and early detection of health impairment.

Health personnel in developing countries are often in short supply. It is therefore essential to utilize the health resources available in the most effective manner. Health assistants and primary health care workers may be the only ones to provide occupational health care for agricultural workers. In addition to essential health care, the health care personnel should be trained to educate and train agricultural workers in safety practices.

3. CURRENT OCCUPATIONAL HEALTH PROBLEMS

3.1 Occupational health problems among underserved workers

In developing countries, the traditional model of occupational health care developed or imported from industrialized countries has failed to meet the objective of improving the health of working people. Although basic problems, such as malnutrition, poor personal hygiene, anaemia, schistosomiasis, tuberculosis, malaria, and viral hepatitis, cause many more deaths, loss of productivity and damage to the national economy than occupational diseases, it should not be forgotten that workers also suffer from ill health caused by their working conditions.

The limitations on staff and equipment available for medical and health care require strict avoidance of wastage and careful planning of the distribution of these resources. The physician in charge of the health of the working population must broaden his range of action to include basic public health problems and relevant medical care. Additionally, the effects of industrialization on health should not be ignored. Industrialization brings many new hazards, including accidents, new toxic substances, vegetable and other natural dusts and fibres, and bad organization of work involving prolonged hours of work, shift-work, and lack of transportation. All these health hazards are generally more damaging in developing than in industrialized countries because local industries often have obsolete equipment and a poor working environment, while foreign enterprises do not always

adopt the same precautions in developing countries as they do in their own country. Every physician practising in a developing country must therefore be able to deal with both traditional health problems and the growing health damage caused by industrialization. Ministries of health implementing programmes of primary health care should therefore ensure that all physicians, especially those in rural areas, undergo basic training in occupational health.

3.2 Occupational health problems of industrialization

The Study Group considered the consequences for occupational health in industrialized countries of the continual changes in a variety of sectors: cultural, demographic, socioeconomic, behavioural, political, administrative, technical, technological, and environmental. The Group recognized that these considerations also apply to many industrialized areas within developing countries.

Impressive changes have occurred in recent years in the hazards associated with work as a result of increased knowledge, technical progress, and new methods of work organization. In many industries, mechanization, industrial hygiene and safety practices, and automation have led to a marked reduction in the occupational hazards that threaten a worker's health.

A diminution in the level of acute occupational diseases is particularly evident. For example, in one hospital devoted to occupational medicine where in 1946–47 a case of lead colic was on average treated every 6 days, no cases of lead colic have been treated for the last 10 years, although the industrial activity of the area covered by the hospital has almost doubled (L. Parmeggiani, personal communication, 1986). In most enterprises in developed countries occupational exposure to hazards does not exceed the permitted levels.

These reductions in industrial pollution have increased the relative importance to health of environmental and domestic pollution, such as that from motor vehicles, the burning of fossil fuels, and the smoking of cigarettes. The environment in which workers live is no longer so different from that in which they work, and the effects of environmental exposure augment those of occupational exposure. The interaction between life at work and life away from the workplace has also been increased by current methods of work organization, which involve shift or night work and commuting problems. Family health becomes more and more related to the work situation.

All practising physicians will encounter the effects of work on the health in their patients and will become involved in problems requiring a good awareness of occupational health. This awareness will have beneficial effects on the national health budget if it leads to recognition of the health hazards at workplaces and hence their control.

Prolonged occupational exposure to low levels of dangerous agents may produce other kinds of adverse effects of a stochastic nature, for example malignancies and hereditary defects. Occupational health workers are now more aware of reproductive pathology in workers, of early deterioration of higher nervous functions, and of the subtle involvement of various systems and organs in work-related diseases. The traditional well-defined and even legally recognized occupational diseases are being replaced in the working population by multicausal diseases where the occupational component can be identified only by means of epidemiological investigation (*5*).

Socioeconomic pressure, instability of employment due to technological changes and/or economic recession, increased psychosensorial demands, tense industrial relations, lack of career prospects, some forms of work organization, lack of communication at the workplace and/or inappropriate or inadequate information for workers have all been implicated as important factors threatening the mental health of employees (*6*). Although psychosocial problems are far from being specific to the work environment, the awareness of these problems has greatly increased recently.

After some major industrial disasters and the discovery of previously unsuspected long-term carcinogenic effects of some substances, public opinion has led the legislators in most industrialized countries (European Economic Community, Japan, USA, USSR) to adopt stringent regulations limiting or banning toxic and carcinogenic substances in the workplace. Short-term screening for mutagenicity has become a regular practice with regard to new chemicals. All these developments emphasize the importance of planned monitoring of the individual worker, rather than leaving the recognition of work-related disease to physicians untrained in occupational health.

4. EXISTING RESOURCES

Although the number of workers in the industrialized countries represents only 33% of the world's total labour force (Table 1), the value

of their production, when measured as gross national product, is 3.5 times greater than that of the much larger working populations of developing countries (7). A worker in a developing country whose work produces 7 times less wealth per capita than the work of his or her counterpart in an industrialized country must therefore earn the necessities of life for, on average, a family that is 50% larger with far less efficient means for productive work. In addition, the vast majority of workers in the third world work in conditions that do not meet the minimum standards laid down by the International Labour Organisation.

Table 1. Global distribution of working population and health personnel [a]

	Total population		Working population		Health personnel			
					Doctors		Nurses	
Countries	No.($x10^6$)	%	No.($x10^6$)	%	No.($x10^3$)	%	No.($x10^3$)	%
Developing	3400	75	1240	67	1019	34	2316	36
Industrialized	1200	25	610	33	3025	66	4185	64
Total:	4600	100	1850	100	4044	100	6501	100

[a] Phoon, W.O. et al. *Teaching of occupational health, especially in schools of medicine* (unpublished report, 1986).

The distribution of health professionals, on the other hand, is totally different from that of workers; the 75% of the world's population that live in developing countries are served by only 34% of the doctors and 36% of the nurses, although their morbidity and health situation certainly requires more. Although complete data are not available, the distribution of occupational health and safety experts is undoubtedly even more unequal. For example, out of some 40 black African countries only 7 have industrial hygienists and none have ergonomists.

How can the needs for occupational health staff be met? On this subject the Study Group considered first the available training resources and then discussed various methods such as on-the-job training, self training, distance learning, and others.

4.1 Undergraduate medical training

A recent worldwide investigation sponsored by WHO on the training of medical students in occupational health (W.O. Phoon et al., unpublished data, 1986) included 1228 medical schools out of the 1353 in existence. Responses were received from 636 schools. In 451 of them some training in occupational health was available, it being obligatory in 410 schools (Table 2).

Table 2. Teaching of occupational health in medical schools [a]

Zone	No.	Some teaching of occupational health			No teaching of occupational health
		Obligatory	Elective	Unknown	
Africa	34	28 (82.3)	0	2 (5.9)	4 (11.8)
Asia	214	156 (72.9)	4 (1.9)	2 (0.9)	52 (24.3)
Europe	155	109 (70.4)	14 (9.0)	0	32 (20.6)
Latin America	91	42 (50.5)	1 (1.1)	2 (2.2)	46 (50.5)
Middle East	17	10 (58.8)	1 (5.9)	0	6 (35.3)
North America	112	54 (48.2)	15 (13.4)	0	43 (38.4)
Oceania	13	11 (84.6)	0	0	2 (15.4)
Total	636	410 (64.5)	35 (5.5)	6 (0.9)	185 (29.1)

[a] From Phoon, W.O. et al., unpublished report, 1986.

Since a number of schools where it is known that occupational health departments do exist did not reply, it is fairly certain that occupational health is taught in at least half of the medical schools in the world. In the majority of these schools the final examination includes a paper on occupational health, a number of them have full time staff engaged in training in occupational health, but only a limited number have separate departments, sections, or units concerned with this topic.

As an example of the variation between medical schools, even within one region, Table 3 shows the time spent on occupational health for undergraduate students in some Asian countries. The variation within Europe is equally wide, ranging from no undergraduate training in occupational health in several medical schools, to the position in Poland

where medical students follow 114 hours of lectures and practicals on the principles of occupational medicine in the last year of undergraduate training. In addition, medical students in Poland receive 60 hours of practical training in an industrial health outpatient service, to get acquainted with the working environment, the evaluation of occupational hazards, the outpatient treatment of workers, preventive medicine, and problems of fitness for work.

4.2 Postgraduate medical training

There is little information available about postgraduate training in occupational medicine, except that within the European Economic Community an investigation was carried out in 1977, after the adoption of the principle of the free circulation of medical doctors among the Member States (*8*). At that time, postgraduate training in occupational medicine was provided in Belgium, France, Italy, the Federal Republic of Germany, and the United Kingdom. In the United Kingdom, the amount of teaching was limited, with postgraduate training being provided in only five universities. In 1978, a Faculty of Occupational Medicine was established in London within the Royal College of Physicians and postgraduate training in occupational medicine now leads to accreditation and a formal qualification. However, there is no requirement in the United Kingdom that a practitioner in occupational medicine should possess adequate training or qualification.

It is also known that there are postgraduate courses in Japan (T. Okubo, unpublished report, 1986) and Finland (*9*). A survey presented to a seminar on Occupational Medicine in the Health Services in November 1984, in Mexico, ascertained that out of 12 Latin American countries, manpower training in occupational medicine was available at the technical level in 10 countries; undergraduate level in 6; specialized level in 7; master's degree level in 3. The institutions providing such training were state universities in 8 countries; private universities in 5; state technical schools in 3; private technical schools in 2. Five countries gave fellowships for study abroad.

4.3 Occupational health nursing

There is no accepted international standard of education of an occupational health nurse, and a current priority of the Committee on Occupational Nursing of the International Commission on Occupational Health is to devise a syllabus for a basic orientation course for nurses

Table 3. Training programmes in occupational health for undergraduates [a]

Country or territory	Students to be trained	Teaching centre	Teaching (hours)	Staff involved in OH teaching full/part-time	Number of students	Remarks
Hong Kong	Medical students (3rd year)	Department of Community Medicine University of Hong Kong,	11	2 / 1	250	
	Medical students (2nd–3rd year)	Department of Community Medicine Chinese University of Hong Kong	10-15	1 / 2	150	Proposed programme for 1982
Indonesia	Medical students	Faculty of Medicine University of Indonesia	28	2 / -	150	
Republic of Korea	Medical students	Catholic Medical College	12	3 / 2	100	
Malaysia	Medical students	Medical Faculty University of Malaysia	4	1 / 1	120	
The Philippines	Medical students (2nd/3rd year)	Institute of Public Health University of Philippines University of St. Thomas, University of the East, Far Eastern University Manila Central University Fatima College of Medicine, Perpetual Help College of Medicine, General Emilios Aquinelde College of Medicine, South Western University West Visayan State College, Cebu Doctor's College of Medicine Gullas College of Medicine	Ranging from 3 to 30 hours	1– 6 full-time staff and 1– 7 part-time staff	About 100 to 350 students a year for each	Most courses include factory visits the East

[a] Flores, W. O. et al., unpublished data, 1986.

Table 3. Training programmes in occupational health for undergraduates (continued) [a]

Country or territory	Students to be trained	Teaching centre	Teaching (hours)	Staff involved in OH teaching full/part-time	Number of students	Remarks
Singapore	Medical students (4th year)	Department of Social Medicine and Public Health, National University of Singapore	24	5 / 1	175–200	Includes two factory visits
Sri Lanka	Medical students	University of Colombo, Jaffna, Peradeniya and Ruhuna	4–10	1 / 4	75–150 in each faculty	
Thailand	Industrial Hygienist (M.Sc. in industrial Hygiene)	Faculty of Public Health Mahidol University	576 (2 years)	8 / 10	8	9 credits are awarded, thesis
	Medical students	Occupational Health Division, Ministry of Public Health	30	4 / 1	31	

[a] Pisaro, W.O. et al., unpublished data, 1986

who wish to practise in the field of occupational health. Since 1977, in the USA and later in Alberta, Canada, quality assurance standards have been adopted in relation to occupational health nursing practice. In the large majority of countries, however, occupational health nursing is not a recognized branch of the profession. Only in a few has the training of occupational health nurses reached a high level of efficiency and competence.

In the USA, graduate education programmes are now provided at master's level in 13 states, totalling 16 programmes, nine supported by NIOSH and seven organized by schools of nursing. In the United Kingdom, the Royal College of Nursing Occupational Health Nursing Certificate requires a high academic standard (*10*). Out of 9000–10000 trained nurses engaged in occupational health work in the United Kingdom in 1982, 26% held a certificate, and 23% had taken a short course. The Occupational Health Practice Nurse Award Scheme involves a six-week course on the practical aspects of occupational health nursing (see section 10.4). The same Occupational Health Practice Nurse Award Scheme was started in Nigeria under the guidance of tutors from the Royal College of Nursing. Several post-basic education schemes are offered in New Zealand, ranging from the Occupational Health Nursing Certificate requiring 240 hours of study to the Advanced Diploma of Nursing (one year, full-time) and the two-day Occupational Health Nurse Orientation Course. A distance learning programme has also been started. The Institute of Occupational Health in Helsinki organizes courses of 1–4 weeks on occupational health nursing and also a number of separate courses that are suitable for occupational nurses. In Australia, the standard form of general nurse training is currently a 3-year period of hospital-based employment and schooling. However, in 1983, only 5% of practising occupational health nurses held a formal qualification in occupational health nursing (*11*).

4.4 Training in occupational hygiene

Resources for training and education in occupational hygiene vary even more than in occupational medicine. In France, the profession of occupational hygienist does not exist because hygiene is considered to be an important part of the multidisciplinary activity of the occupational physician. The occupational physician is expected to be able to detect occupational hazards and is required by law to spend one-third of his time visiting workplaces.

In Scandinavian countries, the United Kingdom, the Federal Republic of Germany, and Italy, the training of occupational hygienists is already well developed or under development. The best training facilities are offered in the USA; as a result of federal support (2), there are now occupational hygiene programmes at 14 National Institute for Occupational Safety and Health (NIOSH) Educational Research Centers,[1] and at least 15 more separatew prorammes are being supported by NIOSH. In 1985, these educational programmes resulted in the qualification of 270 hygienists. Occupational information is exchanged annually between 5000 professionals at the American Industrial Hygiene Conference. There are more than 3200 certified occupational hygienists in the USA.

In contrast, undergraduate students in most engineering schools are usually provided with little technical information and no fundamental education on concepts that would enable them to appreciate the nature and complexity of environmental and occupational health problems. In the late 1970s some attempts were made to train undergraduate engineering students in biological and environmental matters in Brazil, Colombia, and the Philippines. Otherwise, there is little training in occupational hygiene elsewhere in the world.

4.5 Training of primary health care workers

The classical approach to ensuring health and safety in the workplace has depended mainly on the enactment of legislation and inspection of workplaces to ensure compliance with safety and health measures and standards. While this approach has no doubt been effective in controlling many specific occupational hazards since the Industrial Revolution, it has not been very effective in the last several decades, particularly in developing countries, for several reasons:

(*a*) The development of private enterprise systems has resulted in large numbers of small and medium-sized workplaces. In many instances, production occurs in the worker's own home. In many of these units there are serious health hazards, including harmful dusts, chemicals, noise, and heat stress. Inspection of such workplaces is practically impossible in view of the large numbers and wide distribution.

[1] *NIOSH: schedule of courses, 1986–87.* Division of Training and Manpower Development, National Institute of Occupational Safety and Health, Centers for Disease Control, Public Health Service, US Department of Health and Human Services.

(*b*) As a result of the introduction of new agricultural techniques, systems based on inspection have become obsolete in so far as agricultural work is concerned. There is a need to develop other systems to protect the health of agricultural workers.

(*c*) Occupational health problems of multiple etiology have gradually increased in type and magnitude. According to a recent WHO Study Group, "work-related diseases" result from exposure to several risk factors, one of which is in the work environment. Examples include chronic obstructive pulmonary disease which mainly results from smoking, but may be aggravated by irritant gases or dusts in the workplace. The low-back-pain syndrome has several risk factors including rheumatic disorders, scoliosis, and inappropriate posture at work.

For these reasons, recent years have seen the emergence of "primary health care" occupational health workers concerned with the health of various "underserved" working populations. These health workers may be elected, semi-skilled workers in small plants or on farms, trained for specific functions, or professional occupational physicians in large industrial establishments whose training includes not only the recognition and control of occupational diseases but also the control of work-related diseases and health promotion in the workplace. Several countries are carrying out studies, with WHO's cooperation, of the feasibility of training primary health care workers in occupational health and of introducing them into the work setting.

5. EDUCATION AND TRAINING OBJECTIVES

5.1 Medical training

5.1.1 *Medical students*

The Joint ILO/WHO Committee on Occupational Health (*1*) stated that undergraduate medical training in occupational health should enable students to:

— appreciate how health is related to work;
— know how the impact of work on physical and mental health may be measured;
— understand the concept of hygiene in industry;

— be familiar with the most important occupational health problems in the country in which they are to work;

— be able to describe the main occupations in the country;

— be able to carry out appropriate examinations, diagnose, plan treatment, and carry out preventive procedures.

As the majority of medical students will devote themselves to medical care, the first objective of undergraduate training relative to occupational health must be to ensure that the clinical history includes questions about current and previous occupations. Of course, no general physician could be expected to have detailed knowledge of all industries, but the role of the occupation and the work environment in the health and life of a patient cannot emerge if the doctor pays inadequate attention to the way the patient spends more than half his active life. Ideally, undergraduate training should cover, in addition to basic knowledge of the main industrial and economic activities in the country, visits to the workplace including meetings with managers and workers' representatives.

Local needs and academic traditions may explain the varied content of the occupational health training provided as part of undergraduate medical education in countries where it exists. The main emphasis on such training may be clinical, environmental, or forensic (legal), and it may be discipline-based or problem-based. The curriculum usually depends on the particular situation of the country concerned and examples of training content are given in section 10 of this report.

A clinical component is an important part of the training in occupational medicine for medical students because occupational diseases still exist and work-related diseases exist everywhere. Evaluation of patients and assessment of their capacity for work brings general physicians into the practice of occupational medicine. Recognizing that medical students tend to be attracted by clinical disciplines and medical care more than by preventive care, greater training impact is likely to be achieved if occupational medicine is taught, at least in part, as a clinical entity and not exclusively as an environmental discipline.

The student should receive adequate basic training before the commencement of training in occupational health. In particular, complex subjects such as the problems of occupational cancer and work-related diseases cannot be taught before some clinical experience has already been acquired. The same applies to the understanding of psychosocial problems and social development. It is therefore recommended that

occupational medicine should not be taught before the student has undergone sufficient training in clinical medicine. Occupational medicine should be a compulsory part of the final examinations in medicine.

5.1.2 *Postgraduate training for physicians*

All physicians choosing a career in occupational medicine should undertake formal training in that discipline leading to a specialized qualification or accreditation. Practical experience as occupational physicians is essential, except for the most basic certificate of competence.

The subject of postgraduate medical training was considered in depth by the Joint ILO/WHO Committee on Occupational Health in 1981 (*1*). That report rightly considered that adequate training in epidemiology and the basic methods of analytical statistics was essential for studying the subtle interactions of health and work. Other branches of study of great importance in the specialized training of the occupational physician include: work-related diseases, occupational cancer, ergonomics, psychosocial issues, reproductive health, rehabilitation, ethics, and health promotion in the workplace.

In addition, the present Study Group re-emphasized a recommendation made by the Joint ILO/WHO Committee in 1981 concerning the usefulness of data processing and computing for the occupational health physician. A computer is invaluable for epidemiological investigations and to undertake the administrative responsibilities of an occupational health service.

5.2 Training in occupational health nursing

The occupational health nurse is increasingly becoming a key element in the practice of occupational health and now the nurse alone takes full responsibility for occupational health services in many workplaces. Furthermore, occupational health nursing is no longer limited to only a few countries. Thanks to international cooperation and interchanges, there are already some occupational health nurses working in developing countries.

5.2.1 *Trainee nurses*

At the trainee level, training for all nurses should include the basic concepts of occupational health, such as:

— interrelations between health and work,
— accidents and occupational and work-related diseases,
— industrial safety and hygiene,
— epidemiology.

The basic training should include other occupational health topics relevant to local and national needs (e.g. ergonomics). It should enable nurses to appreciate priorities among the health needs and demands of working populations. The occupational health component of the basic training of nurses within the primary health care system demands special emphasis.

5.2.2 *Qualified nurses*

In 1981, the Joint ILO/WHO Committee on Occupational Health (*1*) presented the desirable objectives to be included in the specialist training of the occupational health nurse. These were grouped under various headings: health supervision and rehabilitation; health education and counselling; treatment; cooperation; environmental control and accident prevention; and administration of an occupational health department.

In 1986, a WHO planning consultation on nursing in occupational health made recommendations with regard to specialist training in occupational health nursing. Such training would be at a higher level than that of basic nursing education and would include additional topics in relation to:

(*a*) the working environment and its evaluation, e.g., measurement of noise and heat stress;

(*b*) the workers and safety education; and

(*c*) administration of occupational health services, e.g., the organization of periodic health examinations, record-keeping, and health promotion activities.

5.2.3 *Postgraduate training for nurses*

Nurses already trained in occupational health nursing are encouraged to seek higher qualifications in specialized areas of occupational health nursing. This is particularly important for nurses who may become the teachers of occupational health nursing in different countries.

5.3 Training in occupational hygiene

An occupational hygienist may be defined as a science graduate with specialized training in the identification, evaluation, and control of hazards in the work environment that may cause impaired health or other adverse effects. They may have additional training in epidemiological methods, so that, in cooperation with other health personnel, they can assess the extent to which occupational hazards affect health.

The hygienist may often be supported by an occupational hygiene technician who is proficient in particular aspects of occupational hygiene practice, such as dust sampling.

An innovative development has been the creation of "professional hybrids"— occupational safety and health personnel possessing the inquiring mind of the scientist coupled with the problem-solving capabilities of the engineer — for whom an undergraduate training programme now exists, for example, at the University of Texas Health Sciences Center. Such an interdisciplinary qualification is of great interest for the practice of primary prevention, expanding the concept of occupational health yet further. It may be valuable where there is a need for technicians at the intermediate level, capable of performing tasks otherwise requiring the involvement of several specialists, and in countries that have not yet developed the discipline of industrial hygiene engineering in relation to their needs.

The profession of occupational hygiene will have to develop, even change, in response to changes in industrial practice. Training programmes will need to change in parallel with these developments and some of these aspects are highlighted in the rest of this section.

It is important that any training is adequate to the conditions and circumstances in which the acquired knowledge will be applied. In some parts of the world, there are many serious hazards associated with chemical and physical agents, such as fumes, silica dust and intense noise, as well as from biological agents, such as bacteria and moulds. Their evaluation and control must be the main objective of occupational hygiene practice, and must be the main emphasis in the training of

occupational hygienists who will practise under such conditions. As the more obvious hazards are controlled, the approach to the evaluation and control of the work environment gradually changes its focus to that of ensuring comfort and a high quality of life.

The work environment is constantly changing; the introduction of new processes and equipment may decrease or eliminate traditional occupational hazards, while often introducing new ones of a different nature, which occupational hygienists may not be equipped to cope with. This cannot be overlooked in the training of these professionals.

In addition to the changes in training related to the nature of occupational hazards, there must also be changes in relation to their evaluation, once control measures begin to decrease the levels of environmental agents in the workplace. This has particular relevance for the evaluation of airborne contaminants. As concentrations decrease towards the borderline between "safe" and "unsafe", sensitive and reliable evaluations become essential; underestimation may jeopardize workers' health and overestimation may lead to unnecessary control expenditure.

There remains an important problem in the determination of environmental chemicals that can affect health at very low concentrations, if exposure is of long duration, as is the case with carcinogens and allergens. The available analytical methods for some chemicals have lowest detection limits at concentrations higher than those found to be hazardous to health.

These problems are becoming more acute and challenging as new chemicals are continually being added to the list of substances that are hazardous at low concentrations. Training must ensure that there are professionals able to cope with the complexity of such evaluations; continuing education programmes for such professionals are particularly relevant.

As certain chemical, physical, and biological agents are controlled, and as new technologies are introduced, ergonomic factors become increasingly important. Ergonomic problems are already replacing more traditional occupational hygiene concerns in the day-to-day practice of many occupational hygienists; training programmes must also change in relation to the changing role (*12*).

An occupational hygienist should actively promote a multidisciplinary approach to the evaluation and control of hazards and stresses at work. To do this, the occupational hygienist must be trained in the basic principles of epidemiology. There is also a need to be familiar

with related fields such as psychosocial factors at work, occupational safety (accident prevention and analysis), environmental health (air and water pollution), waste management (water supply and basic sanitation), and other public health aspects (prevention of communicable diseases, immunization programmes, nutrition). The comprehensive "risk management" approach should be emphasized and promoted by the occupational hygienist.

5.3.1 *Undergraduate training in occupational hygiene*

In some countries occupational hygiene is taught at the undergraduate level. This permits more extensive training in occupational hygiene skills than is available in some short postgraduate courses for science or engineering graduates. This may, however, be to the detriment of basic science training. There are as yet too few occupational hygiene graduates to permit evaluation of the effectiveness of the undergraduate courses.

Some occupational hygienists are trained only on-the-job and through short courses, in the same manner as the occupational hygiene technicians. It is very doubtful whether such training of hygienists will ever provide the breadth of training necessary for someone who can practice in a variety of workplaces.

5.3.2 *Postgraduate training of occupational hygienists*

The most usual approach to the training of occupational hygienists is for the training to be provided after graduation; the most desirable basic degrees are chemistry, engineering, physics, biology. The postgraduate degree can be at the master's or doctorate level, the former being adequate for those who will practise in the field, and the latter for those wishing to follow an academic career and/or to carry out research. Training activities leading to higher degrees (e.g., Ph.D.) will be available only in countries where an institute or a university develops a programme in occupational hygiene or a related field. Such programmes should be encouraged since they are necessary not only to improve knowledge, but also to educate enough people to become trainers in occupational hygiene, especially for the benefit of developing countries.

5.4 Primary health care workers

The training needs of the working population in general, as well as for those engaged in the delivery of primary health care in the field of occupational health and safety, cannot be overemphasized. The former group should receive general training and special courses should be designed for the benefit of the latter. The main aims should be to create a general awareness of the importance to personal health of the conditions of work and the workplace environment, and appreciation of the effect of personal health on the ability to work.

For the working population, this awareness should be developed by including health and safety in the workplace in the curricula of vocational training institutes, and even within the general education system.

For primary health care workers, there are more specific educational and training objectives. There are three main subgroups of primary health care workers: those in the workplace, whether part of the workforce or based in the community; health personnel in district health centres; and workers' representatives. The needs and objectives of training and education are similar, but the emphasis of the training should depend on the time devoted to health care, the training level reached, the support facilities available in the district or region, and on national needs.

It must be recognized that there are needs for both elementary training, lasting short periods on specific topics and skills, and basic training, lasting several months to provide a base for a wider practice of primary health care.

Before they undertake the basic training the primary health care workers should understand both the positive and the negative interactions between work and health. For any particular individual, the objectives of the basic training must inevitably depend on the needs in the workplace or health centre, the availability of physicians, nurses, or hygienists, etc., and on the other resources that may be required (e.g., analytical services). The economic setting of the workplace must also be taken into account in planning training programmes to ensure their relevance.

With these constraints in mind, the Study Group decided that at the end of the period of basic training, primary health care workers should be able to:

(*a*) survey the workplaces periodically in order to identify potential health and safety risks using appropriate methods, such as direct reading instruments;

(*b*) recognize the general health problems of workers and their possible relation to work;

(*c*) conduct appropriate health promotion programmes;

(*d*) refer cases of illness and injury to the nearest health care unit;

(*e*) provide essential first aid;

(*f*) communicate knowledge and experience acquired in training to fellow workers;

(*g*) collect biological or environmental samples for despatch to appropriate laboratories (this depends on the quality of training and on the technical support available);

(*h*) keep simple health records concerning both individual workers and surveys of working groups.

For primary health care workers based in the community or in district health systems, there are additional training objectives, depending on the types of occupation and of workplace likely to be encountered. They should also be able to:

(*i*) understand how the workplace can cause hazards to workers and the community;

(*j*) recognize the prevalent work-related health problems in the community served, e.g., pesticide poisoning signs and symptoms;

(*k*) take appropriate action in cases of emergencies, major accidents, and suffocation, e.g., chlorine intoxication;

(*l*) map the area and workplaces and the different work activities in the community served;

(*m*) carry out plant surveys, pre-employment and periodical medical examinations (depending, of course, upon the quality of the training programme).

Some of the methods of education and training programmes have already been covered in the 1981 report of the Joint ILO/WHO Committee on Occupational Health (*1*), but it is clear that different methods of training and delivering occupational health information should be followed according to the needs of the groups to be trained. The education programme should give proper consideration to the experience of

the trainees themselves, and to the use of adequate criteria to identify and select priorities relevant to the various health problems affecting the workers.

Some basic information can be given to primary health care workers in the workplace by workplace supervisors, while others may be taught by qualified occupational health personnel. The need for continuing education must be recognized.

5.5 Other professional and technical occupations

In the 1981 report of the Joint ILO/WHO Committee (*1*), in addition to types of personnel mentioned on pages 22–31 the following groups of persons were identified as needing training for specific tasks in occupational health:

(*a*) administrators,
(*b*) managers,
(*c*) architects and designers,
(*d*) chemists and engineers, and
(*e*) occupational health and safety technicians.

The last group consists of people who are technically trained but who are not graduates. It was considered by the Joint Committee in 1981 that, in practice, occupational health and safety measures depend very much on this particular group of people who, within their relatively narrow range of competence, are often more expert than the professionals. Much of their training is "on the job", but many of them also attend specialist training courses.

This view of the role of occupational health and safety technicians was endorsed by the present Study Group. Their education and training should ensure that they are able to:

(*a*) design and apply methods of controlling health hazards;
(*b*) apply methods of accident prevention and ergonomics;
(*c*) apply the principles of plant layout and building and machine design, taking into account the health, safety, and ergonomics aspects;
(*d*) keep records and, in particular, analyse records on environmental stress and accidents;
(*e*) use epidemiological methods to investigate the causes of accidents and their prevention;

(*f*) collaborate and participate in team work in the field of occupational health, safety, and ergonomics;

(*g*) apply rules and regulations on health and safety;

(*h*) work effectively with the other members of the occupational health team; and

(*i*) assist in the education and training of workers and of supervisors in occupational health and safety.

In the workplace, scientists (including chemists) and engineers are the people who are concerned with the handling of potentially dangerous substances and hazardous equipment. It is therefore essential that their basic courses should include a significant component of occupational health and safety.

For architects and designers, simple awareness of the ways that workers function in the workplace is not enough; there is a real need to integrate studies of the work environment into their basic professional training.

In all establishments, big or small, the managers should be familiar with the potential occupational health and safety problems. They should know the relevant legislation and safety standards and play an active part in occupational health and safety committees. Some of them may acquire knowledge by interest, experience, and practice, but specially designed courses, often in association with workers' representatives, are desirable.

Those engaged in the administration of the law on occupational health and safety (e.g., factory inspectors, social security officers, etc.) also need special training. This is sometimes given "on the job", but should be supplemented by special courses to keep pace with technological developments. Those concerned with decision-making and administration (e.g., legislators, policy-makers, etc.) have a central role to play in defining the national and local occupational health and safety needs. They must therefore be fully aware of the true situation in the country or region and should be in a position to indicate the level of priority that should be accorded to occupational health and safety.

5.6 Training for researchers and teachers in occupational health

One of the functions of occupational health departments in training establishments is to develop individuals who have sufficient interest to seek a career in occupational health research. This may be at the basic

level or may involve clinical services for patient care. The educational processes for all occupational health personnel at all levels should encourage the development of skills and interest in research. Government agencies are strongly urged to provide adequate funding and facilities for such research activities. WHO is urged to encourage the development of such programmes, especially in developing countries. It must not be overlooked that the best teachers are usually research workers and increased research training will lead to greater occupational health support in both industrialized and developing countries.

6. CONTINUING EDUCATION

Continuing education is that process of learning which starts after the completion of a formal educational programme; for professionals this may be after postgraduate study. The rapid development of techniques for evaluating the work environment and its effects on man, together with the changing patterns of occupational health practice make continuing education an absolute necessity.

All occupational health personnel, including primary health workers, should undergo refresher courses throughout their careers so that they maintain a good level of knowledge or expertise. This training could take the form of short courses, seminars, conferences, workshops, or clinical sessions. Participation in the activities of the relevant professional societies is often beneficial (see section 7). Government agencies and industries employing such personnel are strongly urged to provide sufficient time and funds for this purpose.

Yet, despite this need for continuing education, even the most recent legislation in this area (the Act dated 12 December 1973 of the Federal Republic of Germany) (*13*) considers further training of the occupational physicians only, with no reference to nurses or hygienists. However, the professional associations for hygienists and ergonomists are active in continuing education, particularly through scientific conferences. The ICOH Nursing Committee (*14*) has taken a more positive policy by producing a list of 160 items that would be most suitable for continuing education programmes; these items correspond to the objectives of a nurse's post-basic training. In addition, the occupational health nurse will benefit from attending training programmes intended for others in the field of occupational health.

The Study Group considered that there were special requirements for the continuing education of occupational hygienists because of the

continual changes in both the work environment and the techniques for its evaluation and control. An accreditation system, with periodic re-evaluations, is highly recommended. Such a system already exists in some countries, usually being promoted by national occupational hygiene association. These approaches to training and professional accreditation were discussed at an international meeting held under the auspices of the Commission of European Communities, the American Conference of Governmental Industrial Hygienists (ACGIH), and WHO, in Luxembourg in June 1986.[1]

For primary health care workers, continuing education may take the same form as the elementary or basic training, i.e., attendance at courses designed to provide appropriate skills. Whereas much continuing education for professionals occurs casually through attendance at scientific meetings, these opportunities are not available for most primary health care workers. Thus, it is essential that their continuing education be properly planned. The planning must take into account the expectations of those, employers or workers, who rely on the occupational health expertise of the primary health care workers.

7. THE ROLE OF PROFESSIONAL ORGANIZATIONS

The role of professional organizations in the organization and implementation of education and training programmes can scarcely be overestimated. Many such organizations have acted as catalysts in stimulating and developing both formal and informal educational programmes.

Congresses, workshops, and other meetings convened by such organizations, play a vital part in keeping occupational health personnel up to date as regards recent advances and innovations in occupational health. This applies at international, regional, and national levels, and in all parts of the world.

Many organizations publish journals, newsletters, video programmes, and information sheets, and these materials have proved invaluable to the educational development of occupational health personnel. The well known lists of threshold-limit-values prepared by the American Conference of Governmental and Industrial Hygienists are

[1] International Workshop and Conference on Education and Training in Occupational Hygiene. The proceedings of this meeting will be published by the ACGIH.

produced annually and ensure that up-to-date information is available to occupational health professionals.

Professional organizations have organized training courses, in both developed and developing countries, for different categories of health personnel. For example, the Philippine Occupational and Industrial Medicine Association has for some years been sending teams of trainers to different parts of the country to provide short courses on occupational medicine to their members and others.

Many professional organizations also run occupational health facilities, at which occupational health personnel receive their practical training. For example, the Korean Industrial Medical Association provides facilities for physicians, hygienists, and nurses to receive occupational health training.

It should be emphasized that professional organizations other than those in the field of occupational health also contribute to education and training; for example, organizations in the fields of engineering and ergonomics also play an important role in furthering the development of occupational health education.

7.1 Development of research

Some organizations are active in the promotion and development of research. For example, the Asian Association of Occupational Health has a Technical Committee on Research, which aims to promote occupational health research in its member countries. In the past six years, three multinational research projects have been completed; the first studied the infrastructure of occupational health services, teaching, and research, and the others were concerned with the hazards of pesticide manufacture and use and in small-scale industries. Through the development of research protocols, methods, and workshops, these projects are contributing to the training in research in Asian countries. All relevant professional organizations are encouraged to consider the development of similar programmes.

7.2 Participation in formal training programmes

In many countries the curriculum committees of occupational health courses have representatives from national professional bodies. This is a good arrangement as it ensures that the courses are run in conformity with the needs of occupational health practice in those countries. In addition, professional organizations are often asked by universities and

other teaching institutions to nominate lecturers for various occupational health courses.

Several professional organizations also take responsibility for the certification at the completion of training in a particular branch of occupational health. For example, in both the United Kingdom and the USA occupational hygienists sit for examinations conducted by the relevant professional body and the successful candidates are certified as qualified professionals in that discipline.

7.3 The role of the International Commission on Occupational Health

The International Commission on Occupational Health (ICOH) represents a very broad spectrum of occupational health professions. In addition to the triennial international congresses of occupational health that it runs, it also has several scientific committees which deal with different areas of professional concern, including one on occupational health education and training. An international conference on that subject will be held at McMaster University in Canada in 1987, to be followed by a second conference in Finland in 1989, and a third conference in the Asia-Pacific region in 1991. The ICOH hopes that through such activities and the sessions on occupational health education and training at each of its triennial congresses, further advances in developing appropriate educational programmes on occupational health will be achieved.

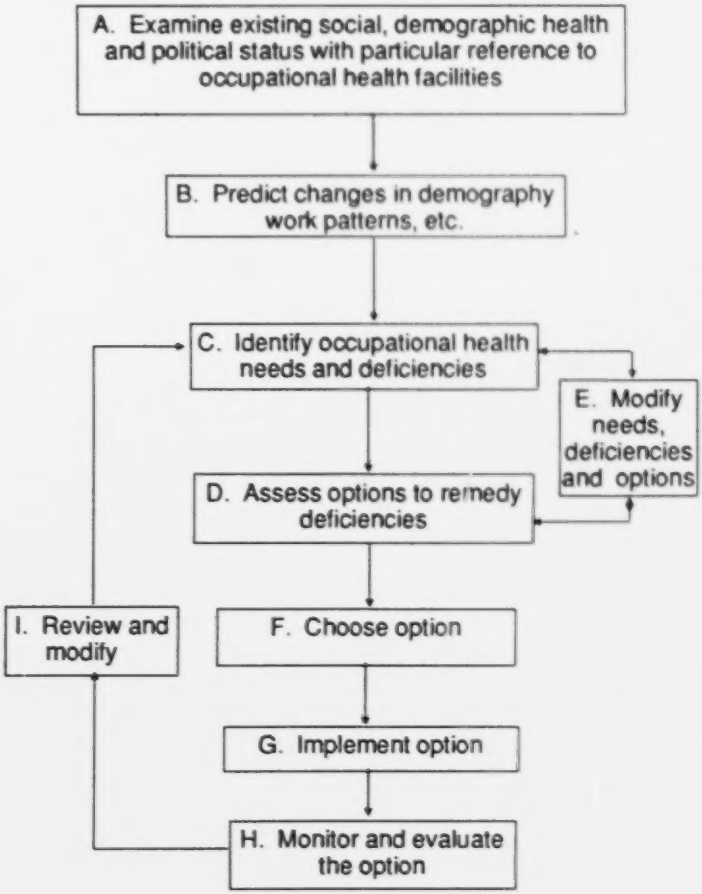
8. MANPOWER PLANNING

Starting from the model presented in the earlier WHO publication entitled *Health manpower planning* (*15*), the Study Group prepared a revised flow chart (Fig. 1) concerning the steps involved in developing a manpower policy for national occupational health and safety requirements. Each of these steps is considered in more detail below.

A. *Present demographic situation and health facilities*

Before planning an education and training policy it is essential to define the population to be served by the occupational health services, its geographical distribution, and the types of worker involved — in particular those exposed to potentially serious hazards to health. The

Fig. 1. Steps involved in developing a manpower policy for national occupational health and safety requirements.


A. Examine existing social, demographic health and political status with particular reference to occupational health facilities
B. Predict changes in demography work patterns, etc.
C. Identify occupational health needs and deficiencies
E. Modify needs, deficiencies and options
D. Assess options to remedy deficiencies
I. Review and modify
F. Choose option
G. Implement option
H. Monitor and evaluate the option

economic and political importance of groups of workers, such as miners and agricultural workers, may also have to be considered.

Such demographic data may be collated at the national, regional, or local level, or may be related to particular kinds of industry: new building operations such as hydroelectric dams and tunnels, or neglected groups of workers in agriculture and deep-sea fishing.

The available occupational health facilities should be identified, for example, the number and quality of workplace health services, government inspectors, and educational and training bodies. The resources of other health care systems should be recorded, together with an indication of the degree of coordination with occupational health care.

B. *Predictable changes in demography and work patterns*

Predictable changes in populations have to be borne in mind, for example, with special reference to age and sex structure, migrant workers, and to developments in particular industries and decline in others. These probable changes must be taken into account in planning future manpower resources.

C. *Identification of occupational health needs*

It is important to assess the numbers of the various types of occupational health professionals needed to meet both the existing deficiencies in health care and to cater for future developments. These optimum numbers will inevitably be modified in the light of economic considerations and the available resources, particularly with respect to teaching resources in universities, polytechnics, and other professional bodies.

D – F. *Assessing options to remedy deficiencies and making a choice*

Having identified needs, the next stage in planning is to assess what is possible; thus making a choice that involves modifying the targets set in step C. Priorities have to be determined, with emphasis being given to allocating resources to those areas (regions or industries) in which the greatest number of workers are exposed to serious health hazards, or in which the level of risk is highest.

G. *Implementing the plan*

The first step towards implementation is to initiate a pilot plan in a particular area. If it proves to be feasible, a plan for, say, 5 years would be put into operation. At the pilot stage and again at the termination of the 5-year plan, evaluation would be necessary and could lead to alteration of the plan or the selection of new options.

H and I. *Monitoring, evaluation and feedback*

The whole manpower planning process should be subjected to continuous monitoring and evaluation, and thus permit modifications to meet deficiencies or previously unidentified needs or even changing political attitudes.

8.1 Policy in education and training

Education and training programmes have to be planned to provide the various categories of staff, e.g., physicians, nurses, hygienists, rural aides, and primary health care workers (non-professional), needed to meet national, regional, or local developments in occupational health care.

A major constraint is likely to be the resources available to educate and train the required manpower. In developing countries the ultimate aim should be for them to provide their own training programmes designed to meet their special needs. In the meantime, the staff will have to be trained in the universities of developed countries. Alternatively, teaching staff from developed countries could help run training programmes in developing countries. Such a policy would depend on support from WHO and ILO.

Any plan for the development of occupational health care needs social and political support if it is to be successful. This depends on government attitudes which are influenced by the support coming from employers and unions.

8.2 Evaluation of existing programmes, curricula, methods of teaching

Any teaching programme requires continuing evaluation of contents, of methods, of duration, of trainers, and of trainees. Relevance of the teaching process to the groups being trained must also be assessed, as must be the benefits to the trained person. The cost is another important question.

Examples of performance indicators to assess the quality of a teaching programme are demand for places, attendance, success in examinations, student opinion on structure, content and presentation, both during the course and at a later date. Other indicators include employers' opinions, career success and impact of the trainees on occupational health.

Introspective assessment by the teachers is essential to the maintenance of a dynamic course. This reflects their awareness of the subject and its changes.

8.3 Distribution of responsibilities for training

In some countries, there are legal requirements for the training of occupational safety and health personnel, and in a few of these the responsibilities are clearly specified and divided between health and labour authorities and the trade unions.

For adequate development of training and education programmes, it is important for the responsibility for these to be assigned to the appropriate bodies, whether they be governmental or independent professional organizations.

9. INTERNATIONAL COOPERATION IN TRAINING ACTIVITIES

International training courses in occupational health have developed from the early activities of technical assistance to developing countries started in the late 1950s by means of international technical cooperation programmes under UNDP, to other schemes of technical cooperation provided first by agencies of the United Nations system alone and subsequently by national governments under bilateral or multilateral agreements.

Recently, international collaboration has increased considerably, and the Study Group felt strongly that such efforts should be supported. Where pooling of resources is desirable for the delivery of international training courses, this should also be encouraged. There has also been great progress in making available information, publications, databases, and training facilities for continuing education in occupational health.

The international training courses organized under the aegis of various international organizations and several well-known scientific institutions, including the WHO Collaborating Centres in Occupational Health, offer the following advantages:

— they respond to internationally recognized needs for training and continuing education,

— they are designed for participants from various parts of the world and therefore are not restricted to local problems,
— they offer opportunities to exchange views not only with the trainers but also with trainees whose experience is different,
— they facilitate international understanding and cooperation,
— some courses involve little cost for the participants,
— they cover different levels of expertise, from the advanced training courses dealing with occupational genotoxicology, biometry, or psychological evaluation of work, work design, and redesign, to more basic needs.

The Study Group recommended that WHO continue to develop international educational programmes in occupational health.

10. SOME EXAMPLES OF TRAINING CONTENT

The Study Group considered it valuable to provide some examples of training content, but it is emphasized that these are only examples and that they should be adapted to local circumstances.[1]

10.1 Elementary courses for primary health care workers

In Botswana, the main approach is in-service training based on recognized and defined needs. The programme for selected workers consists of two-week courses on communicable diseases, health and safety at work in agriculture, and general health education, with one-week refresher courses six-monthly. These workers then spend about one-quarter of their time as health aides covering 4000–5000 workers with support from district health centres and from central health services. This innovative programme is being evaluated by periodical assessment of workers' health status before and after the training of the health aides.

[1] Readers are invited to write to the Office of Occupational Health, World Health Organization, 1211 Geneva 27, Switzerland, to obtain a compendium of existing training courses submitted for consideration by the Study Group.

10.2 Basic courses for primary health care workers

In Chile, there is a basic training programme of about 1500 hours for nursing auxiliaries, but even though many of these people care for workers they receive no formal training in occupational health. So, it is proposed to run a special training programme in occupational health for auxiliaries with at least three years of relevant experience. The course will be given over 10 weeks. The training programme has 10 units as follows:

(*a*) History of occupational health and work ..... 5 hours
(*b*) Organization of occupational medical services ..... 4 hours
(*c*) Recapitulation of concepts of first aid and traumatology 6 hours
(*d*) Basic notions of ergonomics ..... 4 hours
(*e*) Principles of industrial hygiene and safety .....20 hours
(*f*) Professional and work-related diseases .....10 hours
(*g*) Collaboration in auxiliary methods of diagnosis ..... 3 hours
(*h*) Psychology and sociology of work .....10 hours
(*i*) Primary health care in the workplace .....13 hours
(*j*) Concepts of preventive medicine ..... 4 hours

10.3 Occupational hygiene

The recent WHO meeting on occupational hygiene (see section 6) recommended a curriculum for the training of hygienists based on requirements for basic, supporting and core knowledge. The basic requirements are for adequate training in mathematics, physics, chemistry, biology, anatomy, and physiology. The training should provide supporting knowledge in the fields of toxicology, work physiology, occupational diseases, statistics and epidemiology, ergonomics, psychosocial factors, safety, and environmental and public health.

The core content should include:

— Introduction to occupational hygiene.
— Recognition of hazards.
— Evaluation and control of physical agents, such as heat, cold, noise, vibration, radiation, and illumination.

— Evaluation of exposure to airborne contaminants, including sampling, for gases, vapours, and particles; analytical chemistry techniques, instrumentation, and biological monitoring.
— Control technology, environmental and personal.
— Industrial ventilation.
— Organization and management of occupational hygiene services and programmes.

10.4 Occupational health nurses

The United Kingdom Royal College of Nursing organizes an occupational health nursing appreciation course lasting two weeks, an occupational practice nurse course for those already in industry and lasting between 120 and 140 hours, and an extended course leading to an occupational health nursing certificate (MI10). The course for practice nurses covers the following topics:

— Occupational health services, and their relation to management, personnel, unions, and safety representatives.
— Health supervision, including recognition of the signs and symptoms of physical and mental stress, and evaluation of an employee's health.
— Knowledge of the working environment.
— Treatment, including decisions on what to treat and recognition of the boundaries of their own professional practice.
— First aid.
— Health education and health promotion.
— Rehabilitation and resettlement.

10.5 Physicians

The range of courses for undergraduates is very wide. Two examples are given, one based on the disciplinary approach and the other being problem-based.

Example 1

The following information was provided by the Department of Occupational Health, Nanjing Railway Medical College, People's Republic of China.

Description:

A 200-hour programme in the fourth and fifth years.

I. Lectures:
- 1. Work and health ..... (2 hours)
- 2. Work physiology and ergonomics ..... (4 hours)
- 3. Industrial toxicants and their effects ..... (18 hours)
- 4. Dust and pneumoconiosis ..... (10 hours)
- 5. Physical hazards and their effects ..... (16 hours)
- 6. Occupational cancer ..... (3 hours)
- 7. Occupational hazard evaluation ..... (3 hours)
- 8. Occupational hazard control ..... (9 hours)

II. Clinicals ..... (20 hours)

III. Factory visits ..... (20 hours)

IV. Seminars and practicals:
- 1. Occupational epidemiology ..... (8 hours)
- 2. Thermal stress ..... (6 hours)
- 3. Detection and analysis of atmospheric contaminants ..... (20 hours)
- 4. Dust sampling and analysis ..... (8 hours)
- 5. Noise and vibration ..... (4 hours)
- 6. High frequency electromagnetic fields and microwave ..... (4 hours)
- 7. Laboratory tests for occupational diseases ..... (12 hours)
- 8. Industrial toxicology ..... (6 hours)
- 9. Industrial ventilation ..... (8 hours)

V. Tutorials ..... (20 hours)

Example 2

At the Gezira University in Sudan, the curriculum for medical students is based on an integrated, community-oriented, problem-solving approach. The main occupational health input occurs in the course on "Man and his environment". The components of this course are:

1. Man and pollution of aquatic and terrestrial ecosystems.
2. The physical environment: noise, heat, and light.
3. Monitoring of physical environment: noise, heat, and light.
4. Pesticides: groups, routes of entry, exposure in different activities, factors affecting toxicity, preventive measures.
5. Exposure/effect relationship.
6. Heavy metals: lead, chromium and mercury.
7. Inhaled particles: fate and effect.
8. Irritant gases and vapours.
9. Workplace ventilation systems.
10. Factory field visit.
11. Discussion of a particular health problem.

In the " Nutrition" course, the toxicities and effects of deficiencies of iodine, zinc, lead, copper, and selenium are discussed. The "Respiratory system" course is used to discuss byssinosis, silicosis, asbestosis, and agricultural pulmonary hazards. In other courses, lectures are given or planned on cardiovascular diseases and occupational health, pesticides, occupational blood diseases, chemical poisoning and post-traumatic effects on the central nervous system.

11. RECOMMENDATIONS

1. The curricula of education and training courses in occupational health should respond to the newly recognized needs of the working population, with special regard to work-related diseases, reproductive health, underserved working populations in developing countries, aging, and workers' participation. They should also be adapted to cater for changes in the types of hazard to which workers are exposed.

2. All medical faculties are urged to provide undergraduate training in occupational health as a part of the basic curriculum for the medical degree.

3. Education in occupational health and safety should be included in the practical training of primary health care workers.

4. The training programme of all nurses should include basic education in occupational health.

5. All curricula of postgraduate public health training should include occupational health.

6. Vocational training schools should include occupational safety and health in their curricula.

7. The training programmes for technical and administrative staff, designers, architects, and production engineers should include training in occupational health, safety, and ergonomics. They need to be aware of the way design can affect work and health.

8. Workers' education in occupational safety and health should be so designed as to ensure the highest level of workers' participation.

9. Elements of safety and health education should be included in primary education. Occupational health and safety education should be included in programmes of secondary schools.

10. International cooperation in training activities should be continued and developed.

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